

## **Artikel 964 - Diagnos av bromssystemet**

*(Alla 1965, 1966 och 1967)*

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Diagnosis of the 1965, 1966 and 1967 car and truck brake systems is fully covered in this article to aid service salesmen and mechanics in correcting brake problems quickly and accurately.

Test procedures for checking brake pedal free height and travel measurements, vacuum operated parking brakes, and the 1967 dual-master cylinder brake systems are included as a supplement to the diagnosis procedures.

Refer to Group 2 — Brakes of the applicable shop manual for the subject vehicles to obtain the specifications, repair and adjustment procedures to correct brake problems.

### **BRAKE SYSTEMS TESTS**

#### **DUAL-MASTER CYLINDER BRAKE SYSTEM**

1. Turn the ignition switch to the ACC or ON position. If the light on the brake warning lamp remains on, the condition may be caused by a defective switch, grounded switch wires or the differential pressure valve is not centered. Centralize the differential pressure valve as outlined under Hydraulic System Bleeding and Centralizing of the Differential Valve in Group 2, Part 2-1 of the applicable 1967 shop manual. If the warning light remains on, check the switch connector and wire for a grounded condition and repair or replace the wire assembly. If the condition of the wire is good, replace the brake warning lamp switch.
2. If the brake warning lamp does not light when a pressure differential condition exists in the brake system, the warning lamp may be burned out, the warning lamp switch is inoperative or the switch to lamp wiring or relay (if so equipped) has an open circuit. Check the bulb and replace it, if required. Check the relay (if so equipped) switch to lamp wires for an open circuit and repair or replace them, if required. If the warning lamp still does not light, replace the switch.

#### **BRAKE PEDAL FREE HEIGHT AND TRAVEL MEASUREMENTS**

On power brake equipped vehicles, the engine should be running for full power brake operation, measure the brake pedal free height, and check the brake pedal travel with the use of the Rotunda Brake Effort Gauge Tool WRE500-50 as follows:

##### **BRAKE PEDAL FREE HEIGHT MEASUREMENT**

1. Insert a slender, sharp pointed prod through the carpet and sound deadner to the dash panel metal and measure the distance to the brake pedal (Illus. H1533-A).
2. If the position of the pedal is not within specification (Illus. H1533-A), check the brake pedal linkage for missing bushings or loose attaching bolts and replace them, if required.
3. If the pedal free height is still out of specification, check the brake pedal booster push rod or master cylinder to be sure the correct parts are installed. Replace the defective parts as necessary.

## **BRAKE PEDAL TRAVEL MEASUREMENT**

1. Install a brake pedal effort gauge on the brake pedal pad (Fig. 2).
2. Hook a steel measuring tape to the brake pedal as shown in (Fig. 1). Measure and record the distance from the brake pedal free height position to the reference point, which is at the six o'clock position on the steering wheel rim.
3. With the steel tape still hooked to the brake pedal depress the brake pedal by pressing downward on the brake pedal effort gauge. Apply a 50 pound load to the center of the pedal by observing the pressure gauge, and measure the distance from the brake pedal to the fixed reference point on the steering wheel rim parallel to the centerline of the steering column.
4. The difference between the brake pedal free height and the depressed pedal measurement under a 50 pound load should be within the specified maximum pedal travel service specification "B" in (Fig. 1).
5. If the pedal travel is 1 more than the specified maximum shown in (Fig. 1), dimension "B", make several "sharp" reverse stops (equivalent to 50 pounds pedal pressure) with a forward stop before each. Move the car in reverse and forward for a distance of approximately ten feet; then apply the brakes sharply and hold the brake pedal down until the car is completely stopped. This will actuate the brake self-adjusters. If these stops do not bring the brake pedal travel within specification, make several additional forward and reverse stops as outlined above.
6. If the second series of stops do not bring the brake pedal travel within specification, remove the brake drums and check the brake adjusters to make sure they are functioning. Check the brake linings for wear or damage. Repair or replace all worn or damaged parts and non-functioning adjusters. Adjust the brake lining outside diameter to the approximate inside diameter of the brake drum with Rotunda Tool HRE 8650 (Fig. 3).
7. If all the brake adjusters, brake drums and linings are functional and the brake pedal travel is not within specifications, check the pedal linkage for missing bushings, or loose attachments. Bleed the brake and centralize the differential valve.

## **VACUUM OPERATED PARKING BRAKE**

Visually check the operation of the brake linkage as the brake pedal is depressed. Then, check the operation of the brake linkage when the manual release lever is activated. These checks should indicate whether the manual parking brake control linkage is operating properly or requires repair or adjustment (as outlined in Group 2 of the applicable shop manual) before performing tests of the parking brake vacuum system and controls.

Diagnosis of vacuum controlled systems is basically similar to electrical diagnosis. That is, the vacuum system must be complete from the source to the vacuum components. Any leaks, like a bad connection, will make the system inoperative. If a leak develops in one of the vacuum systems, one or all of the vacuum components may become inoperative. This would be dependent on the location of the vacuum leak. If the leak is in the vacuum supply, all systems will become inoperative. If the leak is in the component side of the vacuum control for the specific system, all other systems will operate when the leaking system is off.

When testing a parking brake vacuum control system, a minimum of 10 inches or vacuum (Hg.) should be available at all points where vacuum is applied. This can be checked with a Rotunda Fuel Pump Tester Gauge (ARE 345) and two Distributor



For easy reference, the problem conditions and diagnosis procedures are grouped in the following general categories:

**Noise Conditions**

Disc or Drum Brakes — Cars or Trucks

**Vibration Conditions**

Disc or Drum Brakes — Cars or Trucks

**Performance Conditions**

Disc or Drum Brakes — Cars or Trucks

Air Brake Air Supply System — Trucks Only

**Miscellaneous Conditions** — Cars or Trucks Parking Brakes

Dual Brake System Warning Lamp Each diagnosis procedure lists all of the probable causes of the problem condition, with the **MOST PROBABLE** causes (**OR THE EASIEST TO TEST COMPONENTS**) listed first.

**To diagnose problems quickly and accurately, the service salesman must determine what is bothering the customer.** It is essential to ask the right questions while interviewing the customer to pin the complaint down to one of the problem conditions listed in the Table of Contents which follows. Upon completion of the customer interview, the service salesman should use the exact wording of the Problem Condition in preparing the repair order. Then, the Service Technician will have a direct reference to the required diagnosis procedure. If the customer's complaint fits more than one of the conditions listed, be sure all of them are noted on the repair order and that they are marked as to which one should be diagnosed and repaired first.

The Service Technician should refer to the diagnosis procedure appropriate to the complaint on the repair order. The diagnosis procedures should be followed step-by-step, as described in the example which follows, to determine the cause of the complaint. For example, under Noise at Brake Pedal or Dash Area (Page 5, the most probable cause is:

**1. Stop light switch is improperly assembled (squeak or click)**

The first step is to make the indicated check which is:

Actuate brake pedal and check for a squeak or click at stop light switch. Check for improperly assembled or missing parts.

If the checking procedure is unfamiliar to you, the third column gives the **reference** where you can find more complete information in the **appropriate shop manual**:

**Group 2**

If the checking procedure shows there is a defect, the fourth column indicates the necessary corrective action:

Replace all worn, damaged or missing parts, if required.

Install switch properly.

If the checking procedure does not show a defect, go on to the next probable cause!

**2. Brake pedal pivot bushings improperly installed or require lubrication (squeak)**

Continue to follow the procedure step-by-step until the cause of the condition is found.

When trouble diagnosing wedge and cam-type air brakes and air hydraulic-type brakes on trucks, investigate the entire system since braking problems may originate in many parts of the air brake system other than those covered under Problem Conditions, Drum Brakes — Cars or Trucks.

To find sources of trouble in the wedge and cam-type air brakes and the air hydraulic-type brakes, refer to Group 2, Part 2—1 of the appropriate Ford Truck Shop Manual and perform the Operating Tests noted under Air Supply System. The operating tests will pinpoint the trouble to a specific area of the air brake system and related parts.

Correct all malfunctions of the truck Air Brake - Air Supply System and the Brake Booster prior to removing a brake drum to correct brake drum, shoe and lining, brake spider or backing plate defects that are listed under Performance Conditions - Disc or Drum Brakes — Cars or Trucks.

## **BRAKE SYSTEM PROBLEM CONDITIONS - TABLE OF CONTENTS**

### **PROBLEM CONDITION**

#### **NOISE CONDITIONS**

##### **Disc or Drum Brakes — Cars or Trucks Page**

[A. Noise at Brake Pedal or Dash Area](#)

[B. Noise at Wheels — Only When Brake Pedal Pressure Applied](#)

[C. Noise at wheels — Brake Pedal Pressure Released](#)

#### **VIBRATION CONDITIONS**

##### **Disc or Drum Brakes — Cars or Trucks**

[D. Vibration at Wheels — Brake Pedal Pressure Released](#)

[E. Vibration at Wheel\(s\) — Brake Pedal Pressure Applied](#)

#### **PERFORMANCE CONDITIONS**

##### **Disc or Drum Brakes - Cars or Trucks (Including Air Hydraulic Wedge-Type and Cam-Type Air Brakes)**

[F. Vehicle Pulls to One Side — Brakes Applied](#)

[G. Vehicle Pulls to One Side When Driving — Brakes Released](#)

[H. Brake Grab or Inadvertent Lock-Up — Brakes Applied](#)

[I. Excessive Pedal Travel and/or Low Pedal](#)

[J. Brakes Do Not Apply](#)

[K. Excessive Pedal Effort Required To Fully Apply Brakes](#)

[L. Pedal Feels Spongy \(Brakes Fully Applied\)](#)

[M. When Fully Depressed, Brake Pedal Slowly Moves to Floor](#)

[N. Insufficient Braking With Brakes Fully Applied](#)

[O. Brake Drag \(Slow or Incomplete Release\) — Brakes Released](#)

##### **Brake Booster - Disc or Drum Brakes - Cars or Trucks**

[P. Rough Engine Idle or Stall — Brakes Released](#)

[Q. Rough Engine Idle or Stall — Brakes Applied](#)

[R. Brakes Do Not Release — Trucks Only](#)

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## MISCELLANEOUS CONDITIONS -Cars or Trucks

- [T. Parking Brake Will Not Fully Return or Release — Cars Only](#)
- [U. Parking Brake Will Not Fully Return or Release — Trucks only](#)
- [V. Parking Brake Requires Excessive Pedal Effort to Lock — Cars Only](#)
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## PERFORMANCE CONDITIONS

### Air Brake — Air Supply System — Trucks Only

- [AB. Excessive Oil or Water in the Brake System](#)
- [AC. Continuous or Intermittent Compressor Knocks](#)
- [AD. Air Pressure Below Normal](#)
- [AE. Air Pressure Rises Above Normal](#)
- [AF. Safety Valve Blows-Off](#)
- [AG. Quick Air Pressure Drop With Engine Stopped](#) — Brakes Released;  
Brakes Applied
- [AH. Brakes Release Too Slowly or Will Not Release](#)
- [AI. Low Pressure Indicator Valve Does Not Operate](#)

[ADDITIONAL INFORMATION](#) - (Additional brake-related TSB articles)

# GROUP 2 (A)

READ MORE:

## NOISE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS NOISE AT BRAKE PEDAL OR DASH AREA

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1 Stop light switch is improperly assembled (squeak or click)	Actuate brake pedal and check for a squeak or click at stop light switch. Check for improperly assembled or missing parts.	Group 2, Parts 1 and 2	Replace all worn, damaged or missing parts, if required. Install switch properly.
<b>IF OK:</b>			
2 Brake pedal pivot bushings improperly installed or require lubrication (squeak)	Actuate brake pedal and check for squeak at pivot bushings. Check for missing, improper installation or lack of lubrication at bushing.	Group 2, Parts 1 and 2	Replace worn, damaged or missing parts and lubricate bushings.

<b>IF OK:</b>				
3	Steering column grommet improperly installed (squeak or grind).	Apply pressure back and forth at steering column grommet area to isolate squeak. Check for improperly installed grommet.	Group 3	Install grommet correctly, if required. Apply RuGlyde to squeak area of grommet
<b>IF OK:</b>				
4	Push rod boot improperly installed (Squeak or grind).	Apply pressure back and forth at push rod and boot area to isolate squeak.	Group 2	Install boot correctly if required. Apply RuGlyde to boot at push rod rubbing surface.
<b>IF OK:</b>				
5	Brake booster (power brakes) linkage binds (squeak).	Actuate brake pedal to isolate noise to specific area of linkage. Check for lack of lubrication, binds, worn or damaged parts.	Group 2	Replace worn or damaged parts. Lubricate linkage.
<b>IF OK:</b>				
6	Brake booster filter is restricted (hiss)	Start vehicle. Actuate brakes and check for hiss noise at filter. Check for filter obstruction	Group 2	Remove obstruction. Clean filter, if required.
<b>IF OK:</b>				
7	Brake master cylinder mounting is loose (squeak).	Apply pressure back and forth at master cylinder to check for loose mounting. Check mounting bolt torque.	Group 2	Tighten master cylinder attaching nuts to specification.
<b>IF OK:</b>				
8	Brake booster (Power brakes) mounting is loose (squeak).	Apply pressure back and forth at brake booster to check for loose mounting. Check mounting bolt torque	Group 2	Tighten booster attaching nuts to specification.
<b>IF OK:</b>				
9	Master cylinder push rod (power brakes) is maladjusted (grunt) .	Actuate brake pedal to isolate noise to power brake unit.	Group 2	Adjust push rod to specification.

## **GROUP 2 (B)**

### **NOISE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS**

# NOISE AT WHEELS — ONLY WHEN BRAKE PEDAL PRESSURE APPLIED

READ MORE:

	<b>Most Probable Cause</b>	<b>Action Indicated</b>	<b>Reference For Appropriate Shop Manual</b>	<b>If Defective</b>
1	Worn drum brake linings (scraping or grinding).	Check condition of brake linings and brake drum surface.	Group 2, Part 1	Replace excessively worn linings in sets (4) only. Machine drums only if inspection proves there is a need.
<b>IF OK:</b>				
2	Drum brake shoe (s) is bent or has cracked welds (clicks or scrapes).	Check brake shoes for a bent condition or cracked welds.	Group 2, Part 1	Replace brake shoe(s) and or linings in sets (4) only.
<b>IF OK:</b>				
3	Drum braking surface is threaded-lathe marks (clicks or snaps).	Check braking surface of drum for thread (lathe) marks (See NOTE 2)	Group 2, Part 1	Machine drum surfaces to obtain proper finish.
<b>IF OK:</b>				
4	Contaminated, dirty or greasy brake or caliper linings (squeal or chatter).	Check condition of brake linings. Check for sources of contamination of lining.	Group 2, Part 1	Clean linings with compressed air. Replace linings in sets (4) only if scored, excessively glazed or contaminated, with brake fluid or grease. Correct source of contamination.
<b>IF OK:</b>				
5	Incorrect brake linings (squeal or squeak).	Check to make sure proper type (FoMoCo) brake linings are installed	Group 2, Part 1	Install proper type and size linings in sets (4) only.
<b>IF OK:</b>				
6	Loose drum brake linings or shoes (squeak or squeal).	Check lining to shoe attachment.	Group 2, Part 1	Install proper type and size linings in sets (4) only.
<b>IF OK:</b>				
7	Cracked drum	Check drum for cracked	Group 2, Part	Replace brake drum.

	(scrape, grind or chatter).	condition.	1	
<b>IF OK:</b>				
8	Drums are worn, scored or improperly machined, (squeak, squeal or chatter).	Check drum for wear or scoring. Also check drum for "threads" left by improper machining (See NOTES 2 and 3).	Group 2, Part 1	Refinish or replace drums.
<b>IF OK:</b>				
9	Weak or incorrect brake shoe retracting spring (squeak)	Inspect to insure springs are correct type, not stretched, or damaged due to overheating. Check to see that springs are properly installed (See NOTE 4).	Group 2, Parts 1 & 2	Replace all worn or damaged parts.
<b>IF OK:</b>				
10	Drum brake shoe and lining assembly not properly seated or positioned (squeak, squeal or chatter).	Actuate brakes and check for proper shoe and lining positioning (See NOTES 5,6,7 and 8). Check for missing or improperly installed hold-down clips. Check for loose parts. Check for scored drums.	Group 2, Part 1	Install shoe(s) and lining(s) correctly. Repair or replace all worn or damaged parts. Machine or replace scored drum.
<b>IF OK:</b>				
11	Drum brake shoe binding on backing plate ledges (snap, scrape or squeak).	Actuate the brakes and check for a bind condition (See NOTES 5, 6 and 7).	Group 2, Part 1	Lubricate the guide ledges. Replace backing plate if ledges are excessively worn or grooved.
<b>IF OK:</b>				
12	Bent or warped drum brake backing plate (scrape or squeal).	Check backing plate for a warped or bent condition (See NOTES 5, 6 and 7).	Group 2	Replace backing plate if it is warped or damaged.
<b>IF OK:</b>				
13	Interference between backing plate flange and brake drum (scrape or squeal).	Check backing plate and flange for evidence of interference (See NOTES 5, 6 and 7).	Group 2, Part 1	Correct the interference condition. Replace any excessively worn or damaged parts
<b>IF OK:</b>				
14	Loose or missing caliper or brake	Check caliper or brake assembly for looseness or	Group 2, Part 2	Replace missing bolts Tighten all attaching bolts

	assembly attaching bolts (chucking, rattle, scraping or clicking).	missing attaching bolts. (See NOTES 9 and 10)		to specificatic and install retaining wire, if applicable.
<b>IF OK:</b>				
15	Caliper brake shoe and lining assembly not properly seated or positioned (squeaks or scrapes).	Actuate brakes. Check caliper assembly for proper positioning and functioning.	Group 2, Part 2	Install correctly Repair or replace worn or damaged parts.
<b>IF OK:</b>				
16	Rotor excessively worn, has excessive runout, or improper surface finish (scraping or clicking).	Install dial indicator and measure rotor runout.	Group 2, Part 1	Replace or refinish rotor if wear or run-out exceeds specification

**NOTE 1.** A rumbling, squealing, or growling noise which is continous usually results from a defective wheel bearing. Isolate the noise to the particular wheel and replace the defective wheel bearing and bearing cup.

**NOTE 2.** A snapping noise when the brakes are applied is usually caused by brake shoes moving away from the backing plate ledges and slapping back against the shoe ledges under the brake shoe retainer spring tension. The shoe movement results from "threaded" drum surfaces due to poor refinishing (turning) operations.

**NOTE 3.** Brake pedal pulsation as the vehicle is braked to a stop is an indication of a brake drum ovality condition. Correction is provided by lightly machining the brake drum.

**NOTE 4.** The condition of brake shoes, retracting springs, hold-down springs and drums should be checked for overheating or overstretching and should be replaced if they are damaged.

**NOTE 5.** A snapping or scraping noise from the brake assembly may result from brake shoe hang-up due to grooves or wear of backing plate shoe ledges. File or stone shoe ledges to remove burrs or slight grooves or replace backing plate if deep grooves are noted. Relubricate ledges.

**NOTE 6.** A grinding or scraping noise emanating from the brake assembly may result from backing plate flange to brake drum interference. Inspect the backing plate flange and brake drum for evidence of interference.

**NOTE 7.** A snapping or thumping sound emanating from the brake assembly when the brake is applied may be caused by looseness or wear of the backing plate. Tighten loose attaching bolts or replace backing plate if holes are worn and enlarged.

**NOTE 8.** If brake squeal was heard during the brake application, the brake lining chamfer at the toe end of each brake shoe might not be to specification. The squeal noise can usually be relieved by grinding the correct chamfer on the toe end of each brake shoe. Brake shoe squeal when pedal is released may be due to lack of lubrication on the backing plate shoe ledges.

**NOTE 9.** A slight groan noise from the front wheel disc brakes during a light brake application or slight releasing of the brake pedal pressure while standing at a traffic light is inherent in the disc brake. The noise can be reduced by applying slightly increased brake pedal pressure to prevent the vehicle from creeping at the traffic light.

**NOTE 10.** A chucking or clicking noise emanating from the front wheel assemblies of disc brake equipped vehicles may be caused by loose or missing caliper attaching bolts.

## GROUP 2 (C)

### NOISE CONDITIONS - DISC OR DRUM BRAKES - CARS OR TRUCKS

#### NOISE AT WHEELS - BRAKE PEDAL PRESSURE RELEASED

**READ MORE:**

	Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1	Tire roughness (thump).	Inspect tires for uneven wear. Over-inflate tires to 50 psi. While road testing vehicle, reduce tire pressure to normal in one tire at a time until rough tire is isolated.	Group 3, Part 1	Replace defective tire.
<b>IF OK:</b>				
2	Wheel cover attachment is distorted (squeak).	Move vehicle back and forth on road surface. Check for squeak at wheel cover.	Group 3	Seat the cover securely with a soft hammer. If squeal persists, repair cover flange or replace cover.
<b>IF OK:</b>				
3	Stones or foreign material in wheel cover (rattle).	Remove cover at noisy wheel to check for foreign material below cover,	Group 3	Remove all foreign material. Install wheel cover securely.
<b>IF OK:</b>				
4	Wheel nuts or studs are loose (click, scrape or grind).	Check for loose wheel nuts or studs.	Group 3	Replace damaged studs or nuts having stripped or excessively worn threads. Tighten studs or nuts securely and check wheel hole for elongation.
<b>IF OK:</b>				
5	Loose front suspension	Check for looseness and perform components (clunk).	Group 3	Replace worn or damaged parts. Correct

		alignment checks.		alignment if out of specification.
6	Worn or loose front wheel bearings (rumbling, squealing, or growling noise).	Check wheel bearing play and adjustment.	Group 3	Adjust or replace wheel bearings.
<b>IF OK:</b>				
7	Improperly adjusted brake shoes-trucks only (scrape or squeal).	Check the brakes for improper adjustment or lack of lining-to-drum clearance with brakes released.	Group 2 Part 1	Adjust brakes
<b>IF OK:</b>				
8	Brake automatic self-adjusters not operating properly.	Check the brakes for improper adjustment with Tool HRE 8650 or lack of lining-to-drum clearance. Check for bind or defective parts.	Group 2, Part 1	Check adjusters for bind or defective parts. Adjust brake to proper clearance. Make several firm reverse stops to insure adjustment at all wheels.
<b>IF OK:</b>				
9	Drum brake shoe(s) bent or has cracked welds (clicks or scrapes).	Check brake shoes for a bent condition or cracked welds.	Group 2 Part 1	Replace brake shoe(s) and/or linings in sets (4) only.
<b>IF OK:</b>				
10	Loose drum brake linings or shoes (squeak or squeal).	Check lining to shoe attachment (See NOTE 4).	Group 2 Part 1	Install proper type and size linings in sets (4) only.
<b>IF OK:</b>				
11	Weak or incorrect drum brake shoe retracting or shoe hold down springs (squeal).	Inspect to insure springs are correct type, not stretched or damaged due to overheating. Check to make sure springs are properly installed (See NOTE 3).	Group 2 Parts 1 & 2	Replace all worn or damaged parts.
<b>IF OK:</b>				
12	Drum brake shoe and lining assembly, not properly seated or positioned, (squeak, squeal or chatter).	Actuate brakes and check for proper shoe and lining positioning (See NOTES 1, 4 and 5). Check for missing or improperly installed hold-down clips. Check for loose parts. Check for a scored brake drum.	Group 2 Part 1	Machine or replace scored drum. Install shoe(s) and lining(s) correctly. Repair or replace all worn or damaged parts.

IF OK:				
13	Bent or warped drum brake backing plate (scrape or squeal).	Check backing plate for a warped or bent condition (See NOTES 1, 4 and 5).	Group 2	Replace backing plate if it is warped or damaged.
IF OK:				
14	Interference between backing plate flange and brake drum (scrape or squeal).	Check backing plate and flange for evidence of interference (See NOTES 1, 4 and 5).	Group 2 Part 1	Correct the interference condition. Replace any excessively worn or damaged parts.
IF OK:				
15	Loose or missing caliper or brake assembly attaching bolts (chucking, rattle, scraping or clicking).	Check caliper assembly for looseness or missing attaching bolts (See NOTES 6 and 7).	Group 2 Part 2	Replace missing bolts. Tighten all attaching bolts to specifications. Install retaining wire, if applicable.
IF OK:				
16	Caliper brake shoe and lining assembly not properly seated or positioned (squeaks or scrapes).	Actuate brakes. Check caliper assembly for proper positioning and functioning	Group 2, Part 2	Install correctly. Repair or replace worn or damaged parts.
IF OK:				
17	Excessive rotor runout (scraping or clicking).	Install dial indicator and measure rotor runout.	Group 2 Part 1	Refinish rotor. Replace rotor if runout exceeds specification for refinishing.

**NOTE 1.** A snapping or scraping noise from the brake assembly may result from brake shoe hang-up due to grooves or wear of backing plate shoe ledges. File or stone shoe ledges to remove burrs or slight grooves or replace backing plate if deep grooves are noted. tk

**NOTE 2.** A rumbling, squealing, or growling noise which is continuous usually results from a defective wheel

bearing. Isolate the noise to the particular wheel and replace the defective wheel bearing and bearing cup.

**NOTE 3.** The condition of brake shoes, retracting springs, hold-down springs and drums should be checked for overheating or overstretching and should be replaced if they are damaged.

**NOTE 4.** Brake shoe squeal when pedal is released may be due to lack of lubrication on the backing plate shoe ledges.

**NOTE 5.** A grinding or scraping noise emanating from the brake assembly usually may result from backing plate flange to brake drum interference. Inspect the backing plate flange and brake drum for evidence of interference.

**NOTE 6.** A slight groan noise from the front wheel disc brakes during a light brake

application or slight releasing of the brake pedal pressure while standing at a traffic light is inherent in the disc brakes. The noise can be reduced by applying slightly increased brake pedal pressure to prevent the vehicle from creeping at the traffic light.

**NOTE 7.** A chucking or clicking noise emanating from the front wheel assemblies of disc brake equipped vehicles may be caused by loose or missing caliper attaching bolts.

## GROUP 2 (D)

### VIBRATION CONDITIONS — DISC OR DRUM

### BRAKES — CARS OR TRUCKS

### VIBRATION AT WHEELS — BRAKE PEDAL PRESSURE APPLIED

Refer to Group 3 - Steering, Suspension, Wheels and Tires, and Group NVH of the Ford Rotunda Diagnosis Manual to obtain lists of vibration conditions that may occur when the brake pedal pressure is released.

## GROUP 2 (E)

### VIBRATION CONDITIONS — DISC OR DRUM

### BRAKES — CARS OR TRUCKS

### VIBRATION AT WHEELS — BRAKE PEDAL PRESSURE APPLIED

#### READ MORE:

	Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1	Loose or worn front wheel bearings	Check bearings for adjustment or damage.	Group 3	Adjust or replace bearings.
<b>IF OK:</b>				
2	Loose front suspension components.	Check for looseness,	Group 3	Replace worn or damaged parts.
<b>IF OK:</b>				
3	Wheel nuts or studs are loose	Check for loose wheel nuts or studs	Group 3	Replace damaged studs or nuts having stripped or excessively worn threads. Tighten studs or nuts securely. Check wheels for hole elongation

<b>IF OK:</b>			
4	Tire and wheel has excessive lateral or radial runout.	Check wheel balance, lateral and radial runout.	Group 3 Balance each wheel. Follow instructions included with Rotunda Wheel Balancer.
<b>IF OK:</b>			
5	Worn or burned drum brake linings.	Check condition of brake linings and brake drum surface (See NOTES 2 and 3).	Group 2 Part 1 Replace excessively worn or burned linings in sets (4) only. Machine drums only if inspection proves their is a need.
<b>IF OK:</b>			
6	Drum brake shoe is bent or has cracked welds.	Check brake shoes for a bent condition or cracked welds.	Group 2 Part 1 Replace brake shoe(s) and or linings in sets (4) only.
<b>IF OK:</b>			
7	Contaminated, dirty or greasy brake linings.	Check condition of brake linings. Check for sources of contamination of lining.	Group 2 Part 1 Clean linings with compressed air. Replace linings in sets (4) only if scored, or contaminated with grease oil or brake fluid. Correct source of contamination.
<b>IF OK:</b>			
8	Incorrect brake linings.	Check to make sure proper type (FoMoCo) brake linings are installed.	Group 2 Part 1 Install proper type and size linings, in sets (4) only.
<b>IF OK:</b>			
9	Loose drum brake linings or shoes.	Check lining to shoe attachment.	Group 2 Part 1 Install proper type and size linings, in sets (4) only.
<b>IF OK:</b>			
10	Cracked drum or rotor.	Check drum or rotor for cracked condition.	Group 2 Part 1 Replace brake drum or rotor.
11	Drums are distorted, worn, out-of-round, scored or improperly machined.	Check drum for out-of-round or wear conditions. Also check drum for "threads" left by improper machining (See NOTES 4 and 5).	Group 2 Part 1 Refinish or replace drums.
<b>IF OK:</b>			
12	Drum brake shoe and lining assembly not properly seated	Actuate brakes and check for proper shoe and lining positioning	Group 2 Part 1 Install shoe(s) and lining(s) correctly. Repair or replace all worn or

	or positioned.	(See NOTES 6, 7, 8 and 9). Check for missing or improperly installed hold-down clips.		damaged parts.
<b>IF OK:</b>				
13	Drum brake shoe binding on backing plate ledges.	Actuate the brakes and check for a bind condition (See NOTES 6, 7 and 8).	Group 2 Part 1	Lubricate the guide ledges. Replace backing plate if ledges are excessively worn or grooved.
<b>IF OK:</b>				
14	Loose, bent or warped drum brake backing plate.	Check backing plate for a warped or bent condition (See NOTES 6, 7 and 8).	Group 2 Part 1	Replace backing plate if it is warped or damaged.
<b>IF OK:</b>				
15	Interference between backing plate flange and brake drum.	Check backing plate and flange for evidence of interference (See NOTES 6, 7 and 8).	Group 2 Part 1	Correct the interference condition. Replace any excessively worn or damaged parts.
<b>IF OK:</b>				
16	Loose or missing caliper attaching bolts.	Check caliper assembly for looseness or missing attaching bolts (See NOTES Part 2 10 and 11).	Group 2	Replace missing bolts. Tighten all attaching bolts to specification.
<b>IF OK:</b>				
17	Caliper brake shoe and lining assembly not properly seated or positioned.	Actuate brakes. Check caliper assembly for proper positioning.	Group 2 Part 2	Install assemblies correctly. Repair or replace worn or damaged parts.
<b>IF OK:</b>				
18	Contaminated, dirty or greasy caliper linings.	Check condition of the brake linings. Check for source(s) of brake lining contamination.	Group 2 Part 1	Clean lining(s) with compressed air. Replace linings if contaminated with grease or brake fluid. Repair or replace worn or damaged parts to prevent further contamination.
<b>IF OK:</b>				
19	Caliper out of parallel, out of alignment or has inadequate clearance with the rotor. Rotor	Check rotor surfaces for evidence of scoring or uneven wear. Check rotor for out-of-parallel condition.	Group 2 Part 1	Replace both halves of caliper assembly, if defective. Refinish or replace rotor, if required.

is out of parallel.

**IF OK:**

20 Excessive rotor runout.

Install dial indicator and measure rotor runout.

Group 2 Part 1

Refinish or replace rotor if runout exceeds specification.

**NOTE 1.** A rumbling, squealing, or growling noise which is continuous usually results from a defective wheel bearing. Isolate the noise to the particular wheel and replace the defective wheel bearing and bearing cup.

**NOTE 2.** The condition of brake shoes, retracting springs, hold-down springs and drums should be checked for overheating and should be replaced if they are damaged.

**NOTE 3.** If the vehicle has 30,000 or more miles of operation on the brake linings or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and entrance of dirt into the cylinder. The cylinder cups should be replaced.

**NOTE 4.** A snapping noise heard when the brakes are applied is usually caused by brake shoes moving away from the backing plate ledges and slapping back against the shoe ledges under brake shoe retainer spring tension. The shoe movement results from "threaded" drum surfaces due to poor refinishing (turning) operations.

**NOTE 5.** Brake pedal pulsation as the vehicle is braked to a stop is an indication of brake drum or rotor runout. Correction is provided by lightly machining the brake drum or rotor.

**NOTE 6.** A snapping or scraping noise heard from a brake assembly may result from brake shoe hang-up due to grooves or wear of backing plate shoe ledges. File or stone shoe ledges to remove burrs or slight grooves or replace backing plate if deep grooves are noted. Relubricate ledges.

**NOTE 7.** A grinding or scraping noise emanating from a brake assembly may result from backing plate flange to brake drum interference. Inspect the backing plate flange and brake drum for evidence of interference.

**NOTE 8.** A snapping or thumping sound emanating from the brake assembly when the brake is applied may be caused by looseness or wear of the backing plate. Tighten loose attaching bolts or replace the backing plate if holes are worn and enlarged.

**NOTE 9.** If brake squeal was heard during the brake application, the brake lining chamfer at the toe-end of each brake shoe might not be to specification. The squeal noise can usually be relieved by grinding the correct chamfer on the toe-end of each brake shoe.

**NOTE 10.** A slight groan noise heard from the front wheel brakes during a light brake application or slight

releasing of the brake pedal pressure while standing at a traffic light is inherent in the brake. The noise can be reduced by applying slightly increased brake pedal pressure to prevent the vehicle from creeping at the traffic light.

**NOTE 11.** A chucking or clicking noise emanating from the front wheel assemblies of disc brake equipped vehicles may be caused by loose or missing caliper attaching bolts.

## **GROUP 2 (F)**

### **PERFORMANCE CONDITIONS — DISC OR DRUM**

# BRAKES — CARS OR TRUCKS

## VEHICLE PULLS TO ONE SIDE — BRAKES APPLIED

### READ MORE:

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1. Wet brake linings and drums.	Question owner in regard to wet driving conditions encountered.		Make a few hard brake applications in a dry area to dry the brakes. Dry the linings and drums with compressed air if conditions will not allow the brake applications.
<b>IF OK:</b>			
2. Unequalized tire pressure or worn tread.	Inspect tires.	Group 3	Inflate all tires to specification. Replace excessively worn tires.
<b>IF OK:</b>			
3. Improperly adjusted or worn front wheel bearings or front end misaligned.	Check front wheel bearings. Perform front end alignment checks.	Group 3 Part 1	Replace excessively worn or damaged wheel bearings. Align front wheels.
<b>IF OK:</b>			
4. Loose front suspension.	Check upper and lower arms for being loose and for missing shims.	Group 3 Part 1	Tighten as required and align front suspension.
<b>IF OK:</b>			
5. Steering gear mesh load not properly adjusted.	Check mesh load adjustment.	Group 3 Part 1	Adjust mesh load as required.
<b>IF OK:</b>			
6. Restricted brake line(s) or hose(s).	Check all brake lines and hoses for obstructions or kinks.	Group 2 Part 1	Remove all obstructions or kinks. Replace all worn or damaged hoses or lines.
<b>IF OK:</b>			
7. Improperly adjusted brake shoes (manual adjusters).	Check the brakes for proper adjustment.	Group 2 Part 1	Adjust as required.
<b>IF OK:</b>			

8.	Brake automatic self-adjusters not operating properly.	Perform preliminary brake system test to check self-adjuster operation (See NOTE 1).	Group 2 Part 1	Make several firm reverse brake stops to ensure adjustment at all wheels.
<b>IF OK:</b>				
9.	Wheel cylinder leaking.	Disassemble wheel cylinder. Clean and inspect for damage or wear.	Group 2 Parts 1 and 2	Repair or replace all damaged or worn parts.
<b>IF OK:</b>				
10.	Contaminated, glazed, dirty or greasy linings.	Check condition of linings. Check for sources of lining contamination (See NOTE 2).	Group 2 Part 1	Clean the linings with compressed air. Replace linings in sets (4) only if excessively glazed or contaminated with grease, oil or brake fluid. Correct source of contamination.
<b>IF OK:</b>				
11.	Defective drum brake shoe retracting springs.	Inspect springs for being broken, missing, distorted or stretched (See NOTE 3).	Group 2 Part 2	Replace springs as required.
<b>IF OK:</b>				
12.	Distorted drum brake shoe, insufficient lining burnish	Inspect brake shoes for these conditions (See NOTE 2).	Group 2 Part 2	Replace distorted brake shoes and burnish shoes as required to obtain full contact.
<b>IF OK:</b>				
13.	Wheel cylinder or caliper piston(s) seized.	Check suspected cylinder or caliper for seizure by having someone apply brakes very lightly and observing action.	Group 2 Parts 1 and 2	Replace wheel cylinder or caliper if seized.
<b>IF OK:</b>				
14.	Improperly ground or worn brake drums, shoes or lining assemblies.	Measure drum(s) and lining(s) with Tools FRE 1431 and HRE 8650 (See NOTES 1, 3 and 4).	Group 2 Part 2	Replace or refinish brake drums. Install correct shoe and lining assemblies in sets (4) only. Adjust brakes.
<b>IF OK:</b>				
15.	Incorrect type of drum brake linings or improper size on one side.	Inspect brake shoes to determine cause.	Group 2 Part 2	Replace brake shoes in sets (4) only, as required.

<b>IF OK:</b>			
16.	Brake lining burned, cracked and distorted.	Inspect brake shoes for having any of these defects (See NOTES 1 and 3).	Group 2 Part 2 Correct contributing cause, then replace brake shoes on that axle in sets (4) only.
<b>IF OK:</b>			
17.	Loose drum brake backing plate.	Check backing plate for evidence of scoring, wear or elongated holes.	Group 2 Part 1 Tighten attaching bolts. Replace all worn or damaged parts.
<b>IF OK:</b>			
18.	Binding of wedge actuating mechanism (wedge-type air brakes only).	Actuate brake and check for a bind condition.	Group 2 Part 1 Replace worn or damaged parts. Lubricate mechanism.
<b>IF OK:</b>			
19.	Binding at brake shoe cam-shafts (cam-type air brake only).	Actuate brake and check for a bind condition.	Group 2 Part 1 Replace worn or damaged parts. Lubricate the camshaft.
<b>IF OK:</b>			
20.	Loosely attached caliper.	Check caliper attaching bolts for looseness and wear.	Group 2 Part 1 Tighten caliper attaching bolts. Install retaining wire, if applicable. Replace assembly if badly worn.
<b>IF OK:</b>			
21.	Caliper shoe and lining assembly not properly seated or positioned.	Use feeler gauge to check for complete lining contact with brakes applied and for free movement of shoe and lining assembly when pedal pressure is released. Check for free operation of caliper pistons.	Group 2 Part 2 Position the shoe and lining properly. Repair or replace worn or damaged parts.
<b>IF OK:</b>			
22.	Excessive rotor runout.	Remove front wheel bearing end play and measure rotor runout with a dial indicator.	Group 2 Part 1 Refinish rotor or replace rotor, if required.
<b>IF OK:</b>			
23.	Caliper linings worn below specification.	Measure the shoe and lining at each side and in the middle of the assembly with a micrometer.	Group 2 Part 1 Replace shoes and linings.

IF OK:			
23. Rear axle out of alignment (dog-tracking).	Check for broken rear spring tie bolt or improper spring seating in axle. Wrong lower rear arm (Ford-Mercury)	Group 3 Part 1	Replace or repair the required parts to align the axle and eliminate dog-tracking condition.

**NOTE 1.** On self-adjusting brakes, the self-adjusting screws have right and left threads. Interchanging the brake self-adjusting screws from one side to the other will retract instead of expand the brake shoes. Adjusting screws are identified with "R" and "L" stamped on the end of each screw to aid in correct assembly.

**NOTE 2.** Brakes become burnished at approximately 200 miles of normal city road operation on new vehicles or after a brake reline operation. After burnishing, the brake system becomes stabilized and the pedal becomes firm.

**NOTE 3.** The condition of brake shoes, retracting springs, hold-down springs and drums should be checked for overheating. The retracting and hold-down springs should be replaced, if damaged.

**NOTE 4.** In some instances, brake shoe misalignment or improper seating can be attributed to threaded drum surfaces caused by poor refinishing (drum lathe turning) operations.

## GROUP 2 (G)

### PERFORMANCE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS VEHICLE PULLS TO ONE SIDE WHEN DRIVING — BRAKES RELEASED

Refer to Group 3 - Steering, Suspension, Wheels and Tires to obtain the list of problem conditions that may cause the vehicle to pull to one side when the brake pedal pressure is not applied.

## GROUP 2 (H)

### PERFORMANCE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS BRAKES GRAB OR INADVERTENT LOCK-UP — BRAKES APPLIED

**READ MORE:**

Most Probable Cause	Action Indicated	Reference For Appropriate	If Defective
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<b>Shop Manual</b>			
1.	Unequalized tire pressure or worn tire tread.	Inspect tires	Group 3 Inflate all tires to specification. Replace excessively worn tires.
<b>IF OK:</b>			
2.	Improperly adjusted or worn front wheel bearings.	Check front wheel bearings for improper adjustment and wear.	Group 3 Part 1 Replace excessively worn or damaged wheel bearing and adjust bearing specification.
<b>IF OK:</b>			
3.	Restricted brake line(s) or hose(s). Dirty or contaminated brake fluid.	Inspect all brake lines and hoses for obstructions or kinks. Check condition of brake fluid (See NOTE 1).	Group 2 Part 1 Remove obstruction. Replace worn or damaged lines or hoses. Drain the system and flush with clean brake fluid. Add specified fluid and bleed system.
<b>IF OK:</b>			
4.	Brake Hydraulic lines from master cylinder to proportioning valve (disc brakes) or differential valve (dual master cylinder) are interchanged.	Inspect routing of lines.	Group 2 Install lines correctly and bleed system.
<b>IF OK:</b>			
5.	Pedal travel restricted causing brake drag.	Check brake pedal free-travel. Actuate brake pedal to isolate cause of restriction.	Group 2, Part 1 Replace worn damaged or missing parts. Lubricate bushings. Check brake pedal free travel.
<b>IF OK:</b>			
6.	Parking brake does not fully release.	Check parking brake linkage for worn or damaged parts. Check parking brake for proper operation and adjustment.	Group 2 Part 1 Replace worn or damaged parking brake linkage parts. Adjust parking brake linkage to specification.
<b>IF OK:</b>			
7.	Brake booster (power brakes) linkage binds or is corroded.	Check brake booster for proper installation, worn or damaged parts.	Group 2, Part 1 On trucks only, replace worn or damaged parts. Adjust booster push rod to specified length. Check brake pedal free travel and height and make adjustments, if required.

<b>IF OK:</b>			
8.	Brake booster (power brakes) is internally faulty.	Start the engine and check the booster for proper operation.	Group 2, Part 1 On cars, replace the power brake booster if a malfunction of the unit is encountered. On trucks, repair or replace worn or damaged parts.
<b>IF OK:</b>			
9.	Contaminated, dirty or greasy caliper linings.	Check condition of linings. Check for sources of lining contamination (See NOTE 2).	Group 2, Part 1 Clean the linings with compressed air. Replace linings if excessively glazed or contaminated with grease or brake fluid. Correct source of contamination.
<b>IF OK:</b>			
10.	Linings worn below specification.	Measure the shoe and lining at each side and in the middle of the assembly with a micrometer.	Group 2, Part 1 Replace shoe and lining.
<b>IF OK:</b>			
11.	Caliper shoe and lining assembly not properly seated or positioned.	Use feeler gauge to check for complete lining contact with brakes applied and for free movement of shoe and lining assembly when pedal pressure is released. Check for free operation of caliper pistons.	Group 2, Part 2 Position the shoe and lining properly. Repair or replace worn or damaged parts.
<b>IF OK:</b>			
12.	Loosely attached caliper.	Check caliper attaching bolts for looseness and wear.	Group 2, Part 1 Tighten caliper attaching bolts. Install retaining wire, if applicable. Replace assembly if badly worn.
<b>IF OK:</b>			
13.	Axle seal leaks (rear only).	Check for leaking rear axle seal. Check brake linings for contamination.	Group 2, Part 1, and Group 4 Replace rear axle seal. Replace brake shoes and linings as sets (4) if contaminated with grease at all.
<b>IF OK:</b>			
14.	Wheel cylinder	Disassemble wheel	Group 2, Parts Repair or replace all

	leaking.	cylinder. Clean and inspect for damage or wear.	1 and 2	damaged or worn parts.
<b>IF OK:</b>				
15.	Brake lining burned or cracked.	Inspect brake shoes for having any of these defects. (See NOTES 2, 3 and 4).	Group 2 Part 1	Correct contributing cause then replace brake shoes and linings as sets (4).
<b>IF OK:</b>				
16.	Wheel cylinder piston (s) seized.	Check suspected cylinder for seizure by having someone apply brakes very lightly and observing action (See NOTE 1).	Group 2, Parts 1 and 2	Repair or replace wheel cylinder if seized
<b>IF OK:</b>				
17.	Drum brake automatic self-adjusters not operating properly.	Perform preliminary brake system test to check self-adjuster operation (See NOTE 4).	Group 2, Part 1	Make several firm reverse brake stops to ensure adjustment at all wheels. Repair or replace defective self-adjuster parts, if required.
<b>IF OK:</b>				
18.	Improperly adjusted brake shoes (Manual adjusters).	Check the brakes for proper adjustment.	Group 2, Part 1	Adjust brakes as required.
<b>IF OK:</b>				
19.	Defective drum brake shoe retracting spring.	Inspect springs for being broken, missing, distorted or stretched (See NOTE 3).	Group 2, Part 1	Replace springs as required.
<b>IF OK:</b>				
20.	Broken wedge return spring on truck brake (Wedge-type air brakes only).	Inspect assembly for broken or stretched return springs (See NOTE 4).	Group 2, Part 1	Replace broken or stretched springs.
<b>IF OK:</b>				
21.	Broken retracting spring or binding hold pins on truck brake (cam-type air brakes only).	Inspect assembly for broken or stretched springs or for bind condition (See NOTE 4).	Group 2, Part 1	Replace broken or stretched springs. Lubricate hold pins.
<b>IF OK:</b>				
22.	Incorrect type of	Inspect brake shoes to	Group 2, Part	Replace brake shoes in

	drum brake linings or wrong size on one side.	determine cause.	1	sets (4), as required.
<b>IF OK:</b>				
23.	Improperly ground or cracked brake drums, shoes or lining assemblies.	Remove the brake drum. Check drum(s) and lining(s) (See NOTES 3, 4, 5 and 6).	Group 2 Part 2	Replace or refinish brake drums. Install correct shoe and lining assemblies in sets (4). Adjust brakes.
<b>IF OK:</b>				
24.	Loose or warped drum brake backing plate.	Check backing plate for bent, warped or loose condition.	Group 2	Replace backing plate if it is bent, warped or damaged.
<b>IF OK:</b>				
25.	Distorted drum brake shoe, insufficient lining contact.	Inspect brake shoes for these conditions (See NOTE 2).	Group 2	Replace distorted brake shoes and burnish shoes as required to obtain full contact.
<b>IF OK:</b>				
26.	Proportioning valve malfunction (disc brakes).	Check operation of proportioning valve.	Group 2 Part 1	Replace proportioning valve.

**NOTE 1.** Contaminated brake fluid can cause swelling of the rubber hoses and the cups in the master cylinder and wheel cylinders.

**NOTE 2.** Brakes become burnished at approximately 200 miles of normal city road operation on new vehicles or after a brake reline operation. After burnishing, the brakes system becomes stabilized and the pedal firm.

**NOTE 3.** The condition of brake shoes, retracting springs, hold-down springs and drums should be checked for overheating, the retracting and hold-down springs should be replaced if damaged.

**NOTE 4.** On self-adjusting brakes, the self-adjusting screws have right and left hand threads. Interchanging the brake self-adjusting screws from one side to the other will retract instead of expand the brake shoes. Adjusting screws are identified with "R" and "L" stamped on the end of each screw to aid in correct assembly.

**NOTE 5.** In some instances, brake shoe misalignment or improper seating can be attributed to threaded drum surfaces caused by poor refinishing (drum lathe turning) operations.

**NOTE 6.** If the vehicle has 30,000 or more miles of operation on the brake linings or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and entrance of dirt into the cylinder. The cylinder cups should be replaced.

## GROUP 2 (I)

### PERFORMANCE CONDITIONS — DISC OR DRUM

# BRAKES — CARS OR TRUCKS

## EXCESSIVE BRAKE PEDAL TRAVEL AND/OR LOW PEDAL

### READ MORE:

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1. Air in the hydraulic system.	Hold the brake pedal in the fully applied position. The pedal should remain in position for at least one minute.	Group 2, Part 1	Bleed the system.
<b>IF OK:</b>			
2. Improper brake fluid.	Check area of master cylinder for signs of percolation (See NOTE 1).	Group 2, Part 1	Drain the brake system and flush with clean brake fluid. Add the specified fluid and bleed the system.
<b>IF OK:</b>			
3. Fluid leakage, master cylinder reservoir empty or insufficient fluid in hydraulic system.	Check for source of leakage. Add fluid to system (See NOTES 1 and 2).	Group 2, Part 1	Repair or replace all damaged or worn parts. Add specified fluid to system. Bleed brakes, as required.
<b>IF OK:</b>			
4. Loose front wheel bearings (disc brakes)	Raise the front wheels off the floor and check for looseness.	Group 3	Adjust wheel bearings to specification.
<b>IF OK:</b>			
5. Master cylinder and/or booster mounting loose.	Check booster or master cylinder for being loose at the dash panel, or the master cylinder being loose on the booster.	Group 2, Part 1	Tighten booster or master cylinder attaching nuts or bolts.
<b>IF OK:</b>			
6. Brake pedal support bracket spacers missing (if so equipped).	Observe distance between pedal support and dash panel	Group 2, Part 1	Install spacers as required.
7. Power brake master cylinder push rod	Check push rod length.	Group 2, Part 1	Adjust push rod to specified length.

improperly adjusted.			
<b>IF OK:</b>			
8.	Brake automatic self-adjuster (s) not operating properly.	Check self-adjuster operation. Make several firm reverse brake stops to check adjustment at all wheels.	Group 2, Part 1 Repair or replace defective automatic self-adjuster parts and adjust brakes. (See NOTE 3)
<b>IF OK:</b>			
9.	Improperly adjusted brake shoes (manual adjusters).	Check the brakes for proper adjustment.	Group 2, Part 2 Adjust brakes as required.
<b>IF OK:</b>			
10.	Wrong drum brake shoe and lining assemblies.	Remove the brake drum(s). Measure drum(s) and lining(s) with Tools FRE 1431 and HRE 8650.	Group 2 Part 2-2 Install correct brake shoes and linings as sets (4). Adjust the brakes.
<b>IF OK:</b>			
11.	Brake linings worn below specifications.	Remove brake drums and/or calipers. Inspect drums, brake linings and/or calipers (See NOTE 4).	Group 2, Parts 1 and 2 Replace brake linings in sets (4). Replace all worn or damaged parts. Adjust the brakes.
<b>IF OK:</b>			
12.	Drum brake retracting springs do not completely return brake shoes. Worn backing plate ledges.	Inspect to make sure springs are correct type, not stretched and are installed correctly. Inspect ledges to make sure that shoes do not hang up.	Group 2, Parts 1 and 2 Replace the spring, if required. Install springs correctly. Replace backing plate if ledges are worn enough to make shoes hang-up.
<b>IF OK:</b>			
13.	Caliper shoe and lining knock back after violent cornering or rough road travel.	Pump the brake pedal very lightly to properly position the caliper pistons (See NOTE 5).	Group 2 Part 1 Advise owner to pump the brake pedal very lightly to properly position the caliper pistons after encountering a violent cornering or rough road travel condition.
<b>IF OK:</b>			
14.	Caliper mounting bolts loose.	Check caliper assemblies for looseness.	Group 2, Part 2 Position caliper and tighten attaching bolts to specifications

<b>IF OK:</b>			
15. Caliper shoe out of flat more than 0.005 inch.	With the use of a feeler gauge, check the metal face of shoe assembly on a flat surface or surface plate for out of flat condition.	Group 2 Part 1	Install new shoe and lining assemblies on the rotors of both front wheels.
<b>IF OK:</b>			
16. Defective wheel cylinder.	Disassemble wheel cylinder. Clean and inspect for damage or wear (See NOTE 4).	Group 2, Part 2-1 and Part 2-2	Repair or replace all worn or damaged parts
<b>IF OK:</b>			
17. Incorrect master cylinder.	Check Master cylinder for correct identification code (if so equipped) or check the master cylinder with one known to be correct.	Group 2, Part 1	Replace master cylinder, as required.
<b>IF OK:</b>			
18. Master cylinder check valve, piston spring, piston or cups are worn or damaged. Piston bore is pitted, worn or corroded.	Disassemble master cylinder and perform cleaning and inspection operations.	Group 2, Parts 1 and 2	Repair or replace worn or damaged parts.
<b>IF OK:</b>			
19. Incorrect brake pedal assembly used on vehicle.	Check the shape of pedal with a known correct pedal.	Group 2, Part 1	Replace pedal as required.

**NOTE 1.** Brake fluid percolation is caused by the use of sub-standard brake fluid with a boiling point that is lower than Ford Motor Company specified brake fluid.

**NOTE 2.** If brake fluid leaks are noted at the brake master cylinder reservoir cover, remove the cover and inspect the cover diaphragm and seal installation.

**NOTE 3.** Excessive brake pedal travel can be reduced by replacing 20 tooth brake adjusting screws with 24 tooth screws on 1966 Ford and Mercury vehicles.

Brake self-adjusting screws have right and left threads. Interchanging the brake self-adjusting screws from one side to the other will retract instead of expand the brake shoes. Adjusting screws are identified with "R" and "L" stamped on the end of each screw to aid in correct assembly.

**NOTE 4.** If the vehicle has 30,000 or more miles of operation on the brake linings or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and entrance of dirt into the cylinder. The cylinder cups should be replaced.

**NOTE 5.** Caliper shoe and lining knock back after violent cornering or rough travel is

inherent in the disc brake system. This condition is not often encountered under normal road driving conditions.

## GROUP 2 (J)

### PERFORMANCE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS ONLY WHEN BRAKES DO NOT APPLY

READ MORE:

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1. Leaks or insufficient fluid in system.	Check for source of leaks. Check fluid level (See NOTE 1).	Group 2, Part 1	Repair or replace all damaged or worn parts. Add specified fluid to system. Bleed the brakes.
<b>IF OK:</b>			
2. Broken or improperly assembled pedal linkage.	Inspect linkage.	Group 2, Part 1	Replace damaged parts.
<b>IF OK:</b>			
3. Air in hydraulic system.	Hold brake pedal in fully applied position. The pedal should remain in position for at least one minute (See NOTE 2).	Group 2, Part 1	Bleed the hydraulic system.
<b>IF OK:</b>			
4. Restricted hydraulic system.	Check for restricted hydraulic system.	Group 2, Part 1	Remove cause of hydraulic system restriction.
<b>IF OK:</b>			
5. Dirty or improper brake fluid in system.	Check condition of brake fluid. Check area for evidence of percolation (See NOTE 3).	Group 2, Part 1	Drain the brake system. Flush the system with clean brake fluid. Add the specified fluid to the proper level. Bleed the brake system.
<b>IF OK:</b>			
6. Master cylinder check valve, piston spring,	Disassemble the master cylinder. Clean and	Group 2, Part 2	Repair or replace damaged or worn parts.

piston or cups are worn or damaged. Piston bore is worn corroded or damaged. inspect for damaged or worn parts.

**IF OK:**

7.	Caliper piston (s) seized or seals leaking,	Disassemble the caliper assembly. Clean and inspect for damaged or worn parts.	Group 2, Part 2	Repair or replace damaged or worn parts.
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**IF OK:**

8.	Wheel cylinder piston seized or seals leaking.	Disassemble the wheel cylinder. Clean and inspect for wear or damage.	Group 2, Part 2	Repair or replace all worn or damaged parts.
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**NOTE 1.** If fluid leaks are noted at the brake master cylinder reservoir cover, remove the cover and inspect the cover diaphragm seal installation

**NOTE 2.** On power brake equipped vehicles, excessively high line pressure build-up due to allowing pedal travel to exceed the normal travel required to stop the vehicle. This condition is not always an indication of air in the hydraulic system. Air in the hydraulic system should always be verified by applying the brakes with the vehicle in motion and noting the position of the brake pedal during normal application.

**NOTE 3.** Brake fluid percolation (boiling) is caused by the use of sub-standard brake fluid with a boiling point that is lower than Ford Motor Company specified brake fluid.

## GROUP 2 (K)

### PERFORMANCE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS EXCESSIVE PEDAL EFFORT REQUIRED TO FULLY APPLY BRAKES

**READ MORE:**

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1. Wet brake linings and drums.	Question owner in regard to wet driving conditions encountered.		Make a few hard brake applications in a dry area to dry the brakes. Dry the linings and drums with compressed air if conditions will not allow the brake applications.

<b>IF OK:</b>			
2.	Vehicle is overloaded.	Check for overloaded condition.	Owner Manual Lighten load and road test the vehicle to see if condition has been corrected. Advise owner or correct loading.
<b>IF OK:</b>			
3.	Insufficient intake manifold vacuum (power brakes).	Perform a manifold vacuum test	Group 8, Part 1 Repair or replace component parts causing vacuum leakage.
<b>IF OK:</b>			
4.	Damaged or dented booster body (power brakes.)	Check booster body for dents or other external damage.	Group 2, Part 2 Replace damaged parts (truck) or replace booster (car).
<b>IF OK:</b>			
5.	Leaking air hydraulic brake booster (power brake) control tube or seal (truck).	Check control tube and seal for leaks.	Group 2, Part 2 Repair or replace worn or damaged parts.
<b>IF OK:</b>			
6.	Air leaks at air hydraulic brake booster (power brake) lubrication pipe plug (truck).	Check pipe plug for leaks.	Group 2, Part 2 Tighten plug or replace damaged or worn part.
<b>IF OK:</b>			
7.	Air hydraulic brake booster (power brake) diaphragm improperly installed (truck).	Check to see that the booster diaphragm is installed with the concave side toward the threaded end of the stem assembly.	Group 2, Part 2 Install diaphragm correctly.
<b>IF OK:</b>			
8.	Brake booster (power brake) vacuum or air hoses incorrectly routed.	Check routing of all vacuum or air hoses.	Group 2, Part 2 Route all lines correctly.
<b>IF OK:</b>			
9.	Clogged or blocked booster (power brake) air cleaner, vacuum or air lines or fittings.	Check all vacuum or air lines for obstructions or restrictions.	Group 2, Part 2 Remove any obstruction or restriction. Replace any worn or damaged lines.
<b>IF OK:</b>			

10.	Damaged or improperly adjusted brake pedal linkage. Brake pedal travel is restricted.	Check operation of brake pedal for binding or sticking. Check for missing bushings or pedal support spacers. Check adjustment of brake pedal	Group 2, Part 1	Repair or replace worn or damaged parts. Replace missing parts. Lubricate the linkage pivot points. Adjust the brake pedal to specification.
<b>IF OK:</b>				
11.	Improper booster (power brake) push rod adjustment.	Check push rod adjustment with fabricated gauge.	Group 2, Part 2	Adjust push rod to specification.
<b>IF OK:</b>				
12.	Sticking booster (power brake) control valve (truck).	Check operation of booster control valve. Check control valve piston and bore for scoring or corrosion. Also check control valve piston return spring.	Group 2, Part 2	Repair or replace worn or damaged parts.
<b>IF OK:</b>				
13.	Booster (power brake) diaphragm (s) ruptured or damaged (trucks).	Disassemble booster and check diaphragm for damage.	Group 2, Part 2	Replace diaphragm.
<b>IF OK:</b>				
14.	Leaking vacuum brake booster (power brake) check valve (trucks).	Check for evidence of wear or damage to check valve, valve return spring, or piston.	Group 2, Part 2	Replace worn or damaged parts.
<b>IF OK:</b>				
15.	Dirty or contaminated brake fluid.	Check the condition of the brake fluid (See NOTE 1).	Group 2, Part 1	Drain the hydraulic system. Flush the system with clean brake fluid and add the specified brake fluid. Bleed the system.
<b>IF OK:</b>				
16.	Hydraulic fluid leak or malfunction in one half of brake (dual-brake) system.	Check for a malfunction in either the primary or secondary brake system.	Group 2, Part 1	Repair or replace worn or damaged parts.
<b>IF OK:</b>				
17.	Brake hydraulic lines from proportioning valve	Inspect routing of lines	Group 2	Install lines correctly.

to wheels are  
interchanged (disc  
brakes).

**IF OK:**

18.	Restricted brake line(s) or hose(s).	Check all brake lines and hoses for obstructions or kinks.	Group 2, Part 1	Remove any obstruction. Replace all worn or damaged lines or hoses.
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**IF OK:**

19.	Contaminated, dirty, dusty, brake fluid soaked or greasy brake linings.	Check condition of the brake linings. Check for sources of brake lining contamination (See NOTE 2).	Group 2, Part 2	Clean the linings with compressed air. Replace the linings in sets (4) if contaminated with oil, grease or brake fluid. Repair or replace worn or damaged parts to prevent further contamination.
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**IF OK:**

20.	Caliper shoe and lining not properly seated or positioned.	Use feeler gauge to check for complete lining contact with brakes applied and for free movement of shoe and lining assembly when pedal pressure is released. Check for free operation of caliper pistons.	Group 2, Part 1	Position the shoe and lining properly. Repair or replace worn or damaged caliper piston parts.
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**IF OK:**

21.	Drum brake shoe and lining assembly not properly seated or positioned.	Actuate the brakes and check for proper positioning of shoe and lining assembly (See NOTES 3 and 4).	Group 2, Part 1	Remove assemblies reinstall correctly. Replace or repair any worn or damaged parts.
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**IF OK:**

22.	Brakes overheated.	Check parking brake for seizure, improper adjustment or application. Check for improperly adjusted, frozen or seized brakes. Check for brake drag at the wheels (See NOTE 5).	Group 2, Part 1	Repair or replace all worn or damaged parts.
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**IF OK:**

23.	Improperly ground	Measure drum(s) and	Group 2, Part	Replace or refinish brake
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or wrong brake drum(s) shoe(s) or lining assemblies.	linings(s) with Tools FRE 1431 and HRE 8650 (See NOTE 4).	2	drums as required. Install correct shoe and lining assemblies in sets (4), if required. Adjust brakes.
<b>IF OK:</b>			
24. Worn Brake linings.	Check for linings worn below specifications (See NOTE 6).	Group 2, Part 1 & 2	Refinish or replace brake drums or rotor, if required. Install correct shoe and lining assemblies in sets (4). Adjust brakes.
<b>IF OK:</b>			
25. Seized or binding caliper assembly.	Disassemble caliper assembly. Clean and inspect for damaged or worn parts.	Group 2, Part 2	Repair or replace all damaged or worn parts.
<b>IF OK:</b>			
26. Seized or binding drum brake wheel cylinder.	Disassemble wheel cylinder. Clean and inspect for frozen or seized pistons, damage or wear.	Group 2, Part 2	Repair or replace all damaged or worn parts.
<b>IF OK:</b>			
27. Master cylinder check valve, piston spring, piston or cups are worn or damaged. Piston bore is pitted worn or corroded.	Disassemble master cylinder. Clean and inspect for damage or wear (See NOTE 1).	Group 2, Part 2	Repair or replace worn or damaged parts.

**NOTE 1.** Contaminated brake fluid can cause swelling of the rubber hoses and the cups in the master cylinder or the wheel cylinders.

**NOTE 2.** Drum brakes become burnished at approximately 200 miles of normal road operation on new vehicles or after a brake reline operation. After burnishing, the brake system becomes stabilized.

**NOTE 3.** A drum-type brake shoe binding or hang-up condition may be attributed to grooves or wear of backing plate shoe ledges. Also, inspect the backing plate flange and brake drum for evidence of interference. File or stone shoe ledges to remove burrs or slight grooves or replace backing plate if deep grooves are noted. Lubricate plate as required.

**NOTE 4.** In some instances, drum-type brake shoe misalignment or improper seating can be attributed to threaded drum surfaces caused by poor refinishing (drum lathe turning) operations.

**NOTE 5.** The condition of the brake shoes, retracting springs, hold-down springs and drums should be checked for overheating, the retracting and hold down springs should be replaced. If shoes have a slight blue coloring indicating overheating.

**NOTE 6.** If the vehicle has 30,000 or more miles of operation on the brake linings or signs of

overheating are present when relining brakes, the wheel cylinder should be disassembled and inspected for wear and entrance of dirt into the cylinder. The cylinder cups should be replaced.

## GROUP 2 (L)

### PERFORMANCE CONDITIONS — DISC OR DRUM BRAKES — CARS OR TRUCKS

#### PEDAL FEELS SPONGY (BRAKES FULLY APPLIED)

READ MORE:

Most Probable Cause	Action Indicated	Reference For Appropriate Shop Manual	If Defective
1. Brake master cylinder mounting is loose.	Apply pressure back and forth at brake booster to check for loose mounting.	Group 2, Part 1	Tighten master cylinder attaching nuts to specification.
<b>IF OK:</b>			
2. Brake booster (power brakes) mounting is loose.	Apply pressure back and forth at brake booster to check for loose mounting to dash panel (See NOTE 1).	Group 2, Part 1	Tighten booster attaching nuts to specification.
<b>IF OK:</b>			
3. Improperly adjusted or damaged brake pedal linkage.	Check operation of brake pedal for binding or sticking. Check adjustment of the brake pedal.	Group 2, Part 1	Repair or replace worn or damaged parts. Lubricate linkage pivot points. Adjust the brake pedal to specifications.
<b>IF OK:</b>			
4. Percolating or contaminated brake fluid.	Check area of master cylinder for evidence of percolation (See NOTE 2). Check for dirty or contaminated brake fluid. (See NOTE 3).	Group 2, Part 1	Drain the brake system. Flush the system with clean brake fluid. Add the specified brake fluid. Bleed the brake system.
<b>IF OK:</b>			
5. Soft or weak brake hose (excessive expansion).	Check for weak or damaged brake hose (See NOTE 3).	Group 2, Part 1	Repair or replace all damaged or worn parts. Add the specified fluid to the system. Bleed the

				brake system.
<b>IF OK:</b>				
6.	Air in hydraulic system, leaks or insufficient fluid in master cylinder or brake system.	Check for source of fluid leaks. Add fluid to the system (See NOTE 4 ).	Group 2, Part 1	Replace worn or damaged brake hose(s) Bleed the brake system.
<b>IF OK:</b>				
7.	Drum brake shoe(s) bent or has cracked welds.	Check brake shoes for bent condition or cracked welds.	Group 2, Part 1	Replace brake shoes and linings in sets (4) only.
<b>IF OK:</b>				
8.	Drum brake shoe and lining assemblies not properly seated or positioned.	Actuate the brakes and check for proper shoe and lining position or contact (See NOTE 5).	Group 2, Part 1	Remove assemblies and reinstall correctly. Repair or replace all worn or damaged parts.
<b>IF OK:</b>				
9.	Improperly ground, distorted, worn or wrong brake drum(s), shoe(s) and lining(s) assemblies (drum brakes).	Measure drum(s) and lining(s) with Tools FRE 1431 and HRE 8650 (See NOTE 5).	Group 2, Part 2	Refinish or replace brake drums, if required. Install correct shoe and lining assemblies in sets (4). Adjust the brakes.
<b>IF OK:</b>				
10.	Faulty wheel cylinder (drum brakes).	Disassemble wheel cylinder. Clean and inspect for evidence of damage or wear (See NOTE 3).	Group 2, Part 2	Repair or replace damaged or worn parts.
<b>IF OK:</b>				
11.	Loosely attached caliper. (disc brakes).	Check caliper attaching bolts for looseness.	Group 2, Part 1	Tighten caliper attaching bolts. Installing retaining wire, if applicable. Replace assembly if badly worn or damaged.
<b>IF OK:</b>				
12.	Damaged or faulty caliper assembly (disc brakes ).	Disassemble caliper assembly Clean and inspect for worn or damaged parts.	Group 2, Part 2	Repair or replace worn or damaged parts.
<b>IF OK:</b>				
13.	Master cylinder check valve, piston spring, piston or cups are worn	Disassemble master cylinder. Clean and inspect for evidence of	Group 2, Part 2	Repair or replace damaged or worn parts.

or damaged. Piston damage or wear (See  
bore is pitted worn or Note 3).  
corroded.

**NOTE 1.** On power brake equipped vehicles, complaints of a soft or spongy power brake pedal condition are frequently incorrectly diagnosed by verifying the complaint with the car stopped. This is not a valid test. Excessively high line pressures build up, allowing pedal travel to far exceed the normal travel required to stop the vehicle. This condition is not always an indication of air in the hydraulic system. Air in the hydraulic lines should be verified by applying the brakes with the vehicle in motion and noting the position of the brake pedal during normal brake pedal application.

**NOTE 2.** Brake fluid percolation is caused by the use of sub-standard brake fluid with a boiling point that is lower than Ford Motor Company specified brake fluid.

**NOTE 3.** Contaminated brake fluid can cause swelling of the rubber hoses and the cups in the master cylinder and wheel cylinders.

**NOTE 4.** If brake fluid leaks are noted at the brake master cylinder reservoir cover, remove the cover and inspect the cover diaphragm and seal installation.

**NOTE 5.** Brakes become burnished on new cars or after a brake reline operation after 200 miles of normal city road operation. After burnishing, the brake system becomes stabilized and the brake pedal firm. Inspect brake linings for lining to brake drum contact and proper burnishing.

Källa: Fordification

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